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MAY 1983 THE NAVAL AVIATION SAFETY REVIEW

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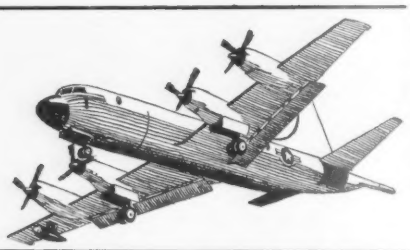
Pressure in the face of grace



IN February we ran an editorial on the inside front cover called "Some Grace Under Pressure." The story was about a flight time derby in which several squadrons were racking up vacant flight hours (droning as opposed to recording meaningful mission, night and instrument time) in an effort to impress their anonymous "Wing" and win the Battle E.

At the end of the story, we championed one commanding officer for finally calling it quits, officially pulling his squadron out of the derby and, in his Battle E cover letter to the Wing, stating, "In this squadron, flight time is used for quality, not quantity."

The fleet response to this story was extremely favorable, but also somewhat amusing. Consider these phone calls.

Ringggggg.

"Hello, APPROACH? I just wanted to call and tell you that we fighter pilots liked your story on droning and accumulating useless flight hours. You really hit those VP guys where they lived, didn't you?"

"Hello, APPROACH? The guys in our helo readyroom wanted to call and thank you for writing that story on racking up vacant flight time. If only those jet jockeys would listen to what you guys are saying, the Navy would have fewer milestones and better pilots . . ."

"Hello, APPROACH? I'll bet those helo pilots are still dazed from the shot you gave them in last month's APPROACH. Keep up the good work . . ."

It's always the other guy, isn't it? Well, I have a solution. Let's blame it on the ultralight pilots! They're kooks anyway, aren't they, with their multicolored Da Vinci creations and suicidal updrafts? Sure. They're the guys who rack up the flight hours and publish the meaningless milestones, the ones who rush their preflights and abbreviate their checklists. Sure, no problems.

It was the ultralight pilots all along.

Or was it?

LT Colin Sargent

approach

Vol. 28 No. 11
NAVAIR 00-75-510

The dark greens of an AH-1 *Huey Cobra* contrast sharply with the desert terrain below. Photo by Capt Joe Doyle, USMC, HML-367.

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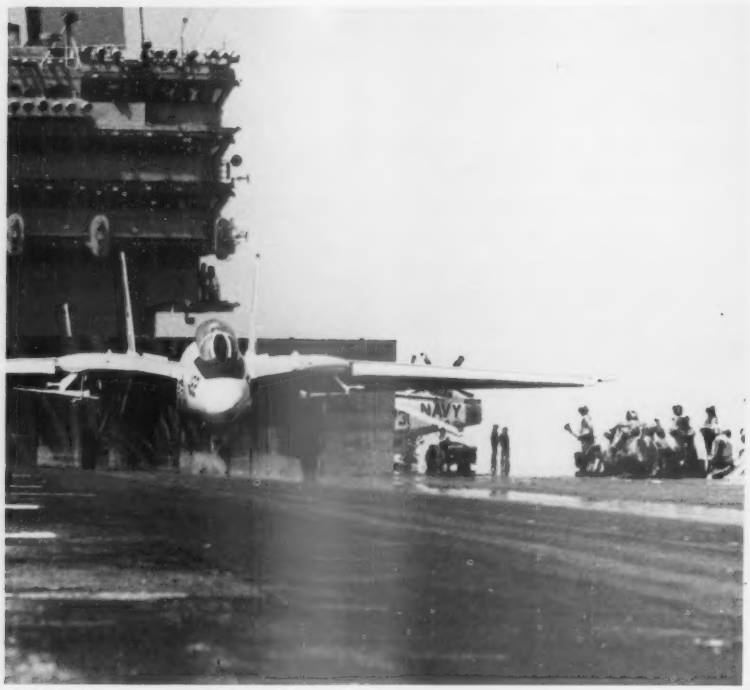
M*A*S*H

(Make Aviation Safety Happen)

III

By Russ Forbush
APPROACH Writer

THE last three lines in "M*A*S*H II," which appeared in the May 1982 issue of *APPROACH*, read like this: "The mishap rate fell to a new low last year, and the opportunity for lowering the rate even further is entirely possible. Extra effort by all hands can make it so. Do it and you will Make Aviation Safety Happen." Well . . .



You did it! An all-time low Class A F/FR mishap rate of 4.45 (subject to update) was recorded in 1982. This bettered the 1981 rate of 5.09.

In this article, we'll highlight some of the gains made last year and home in on areas where improvements can be made this year to meet or better the CNO's Class A F/FR mishap rate goal of 4.0. We'll also take a look at what's happening so far in 1983.

The most dramatic drop in the Class A mishap rate last year occurred within the *Marine Corps* — down from 9.28 in CY 81 to 6.15 in CY 82. This reduction was due in large part to the tremendous effort of FMFLANT in reducing its rate from 15.48 to 7.08. The Fourth MAW made a significant contribution by lowering its rate from 8.36 to 4.29. FMFPAC remained relatively stable in 1982 with a rate of 7.00. Other major commands posting impressive reductions were NAVAIRSYSCOM, down from 16.80 (seven mishaps) to 0.00, NAVAIRPAC, which dropped from 6.07 to 4.32 and the Naval Air Reserve with only one Class A mishap in 1982 (rate 0.60) as opposed to four in 1981 (rate 2.61). Our congratulations to the Marine Corps and other major commands cited above for Making Aviation Safety Happen in 1982. We're confident that those commands whose Class A mishap rates edged upward in 1982 will meet the challenge and rack up reductions in 1983.

Several statistical tables (covering mishaps between 1 January 1977 through 28 February 1983) appear below. Categories include Contributing Factors; All Navy/Marine, Navy, Marine and TYCOM Class A Mishaps; All Navy/Marine Yearly Severity Class A Mishaps; All Navy/Marine, Navy and Marine Embarked/Disembarked Statistics and Severity Class A Ground Mishaps.

Contributing factors in Navy/Marine-wide mishaps are provided in the following table (normalized to account for the changes in threshold definitions). Percent indicates the percentage of the total number of mishaps involving the specific factor given (individual numbers are rounded, while percentages are computed using the exact figures). Since a mishap may involve more than one factor or possibly no factors given in the table, the percentages, in general, do not total 100.

	Class A F/FR Mishaps				Class A/B/C F/FR Mishaps			
	CY 77-81 Average No./Yr.	Percent	CY 82 No.	Percent	CY 77-81 Average No./Yr.	Percent	CY 82 No.	Percent
Pilot Factor	51	48	33	37	146	25	113	18
Selected Factors: Misused flight controls in air	7	6	10	11	16	3	16	3
Violation NATOPS/ regulations	12	11	6	7	20	3	10	2
Loss of Control	13	13	14	16	13	2	14	2
Misjudged distance altitude or position	7	6	8	9	24	4	19	3
Inadequate flight preparation	6	6	3	3	17	3	13	2
Controlling personnel	6	6	6	7	29	5	27	4
Maintenance personnel	9	8	2	2	62	11	56	9
Support personnel	2	2	2	2	12	2	20	3
Supervisory personnel	29	27	7	8	98	17	55	9
Material failure	34	32	33	37	201	35	191	30
Total Mishaps	106		90		579		631	

Of the basic factors provided above, the only categories that had an increase rate in 1982 over the CY 1977 through 1981 averages were:

Class A F/FR Mishaps

Pilot misuse of flight controls in the air
Pilot loss of control
Pilot misjudged distance, altitude or position

Class A/B/C F/FR Mishaps

Support personnel error

On the other hand, the categories of pilot factor, maintenance-personnel factor and supervisory-personnel factor had lower rates in CY 1982 than during CYs 1977 through 1981 for both Class A and Class B/C F/FR mishaps.

Continued

(Please note that all 1982 and 1983 Class A F/FR mishap rates are subject to update and that mishap rates are per 100,000 flight hours.)

Class A F/FR Mishap Rates by TYCOM

	CY 77 Mshps/Rate	CY 78 Mshps/Rate	CY79 Mshps/Rate	CY 80 Mshps/Rate	CY 81 Mshps/Rate	CY 82 Mshps/Rate	CY 83 (Feb) Mshps/Rate
All Navy/Marine	122/6.16	129/6.62	117/6.12	129/6.66	100/5.09	90/4.45	13/4.07
Navy	81/5.05	96/6.20	91/5.87	89/5.63	67/4.16	67/4.06	11/4.24
Marine	41/10.83	33/8.25	26/7.17	40/11.24	33/9.28	23/6.15	2/3.35
LANT	26/5.50	34/6.85	29/6.44	32/6.93	21/4.52	32/6.95	5/7.08
PAC	30/6.07	37/7.70	29/6.43	35/7.93	28/6.07	20/4.32	3/3.75
FMFLANT	17/13.74	13/8.28	12/8.63	13/9.97	19/15.48	9/7.08	0/0.00
FMFPAC	19/10.53	16/9.22	11/6.84	19/11.49	11/6.51	12/7.00	2/7.27
Non-FMF Marine	1/4.16	0/0.00	0/0.00	0/0.00	0/0.00	0/0.00	0/0.00
CNATRA	15/3.54	14/3.70	21/4.56	14/2.88	7/1.43	14/2.71	1/1.34
Naval Reserves	5/3.12	7/4.87	7/4.81	1/.66	4/2.61	1/.60	0/0.00
4th MAW	4/7.94	4/8.77	3/7.62	8/22.65	3/8.36	2/4.29	0/0.00
NASC	5/9.65	4/8.09	5/12.30	7/16.92	7/16.80	0/0.00	2/31.25

Yearly Severity Class A F/FR Mishap Statistics

CY	Hours	Number Mishaps		Destroyed Aircraft		Fatal Mishaps		Fatalities		Dollar Cost
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	
1977	1,981,328	122	6.16	104	5.25	41	2.07	119	6.01	325,136,922
1978	1,948,671	129	6.62	102	5.23	51	2.62	129	6.62	423,271,107
1979	1,911,859	117	6.12	95	4.97	41	2.14	79	4.13	316,038,105
1980	1,936,360	129	6.66	112	5.78	43	2.22	91	4.70	403,362,018
1981	1,966,464	100	5.09	87	4.42	40	2.03	83	4.22	396,547,824
1982	2,024,512	90	4.45	83	4.10	40	1.98	74	3.66	336,151,074
1983 (thru Feb)	319,100	13	4.07	13	4.07	5	1.57	7	2.19	54,466,956

There were reductions made in several key Class A mishap areas in 1982 over 1981. Let's look at them:

The Class A F/FR mishap rate of 4.45 was the lowest ever recorded.

There were nine fewer aviation fatalities.

There were 10 fewer Class A F/FR mishaps.

Four fewer aircraft were destroyed.

The embarked mishap rate fell below 10.0 (to 9.62) for the first time since 1977 (it was 13.55 in 1981).

The cost of flight mishaps dropped some 60 million dollars.

There were only two Class A ground mishaps in 1982 as opposed to six in 1981 and 21 in 1980.

Considering that 1981 was a breakthrough year for naval aviation safety makes the above reductions even more impressive.

What were the major factors leading to the improved year in 1982? First and foremost, command management, from the top down, continued to take an active role in the aviation safety program. This was particularly noticeable at the TYCOM level. TYCOMs spearheaded both flight and hardware improvements in the areas of operations, maintenance and material. They were aided and abetted by functional wing commanders, air wing/air group commanders and CO's who contributed much by keeping their respective TYCOMs fully apprised of critical problem areas, and by providing recommendations for solving these problems. While some of the hardware improvements recommended may not show up for a while, numbers of approved changes to NATOPS and other publications have already been implemented. We foresee even greater emphasis on effective management practices in 1983. In his *Flag Officer Newsgram 19-82,* the CNO addressed "Critical Action Areas for Improved Performance." Navy management and its pursuit of reducing waste was stressed. By reducing mishaps to a minimum, we defeat waste. Through effective management practices we Make Aviation Safety Happen.

A reduction in pilot-factor mishaps was another major accomplishment in 1982. During CYs 1977 through 1981, the average number of pilot-factor mishaps was 51 and the percentage of mishaps was 48. In 1982 the number was 38 and the percentage 37. There's still room for improvement here, though, as there is in all mishaps involving personnel factors.

Communication at all levels of command continues to breathe life into the aviation safety program. This input helps keep everyone informed about a particular hazard or other vital safety information. Additionally, aircrew, maintenance and support personnel have increased their submission of articles for publication in *APPROACH* and *MECH* magazines. These contributions by fleet and shore activity personnel provide our readers with safety information that could prove invaluable to them now or at some future date. Keep 'em coming.

Continued

Navy, Marine, All Navy/Marine Embarked/Disembarked Class A F/FR Mishaps

	Navy			Marine			All Navy/Marine		
	Flight Hours	No. Mshps	Rate	Flight Hours	No. Mshps	Rate	Flight Hours	No. Mshps	Rate
CY 1977									
Total	1,602,787	81	4.46	378,541	41	10.83	1,981,328	122	6.16
Embarked	257,272	21	5.05	22,333	3	13.43	279,605	24	8.58
Disembarked	1,345,515	60	8.16	356,208	38	10.67	1,701,723	98	5.76
CY 1978									
Total	1,548,495	96	6.20	400,176	33	8.25	1,948,671	129	6.62
Embarked	276,328	37	13.39	22,375	0	.00	298,703	37	12.39
Disembarked	1,272,167	59	4.64	377,801	33	8.73	1,649,968	92	5.58
CY 1979									
Total	1,549,041	91	5.87	362,818	26	7.17	1,911,859	117	6.12
Embarked	257,686	32	12.42	23,069	4	17.34	280,755	36	12.82
Disembarked	1,291,355	59	4.57	339,749	22	6.48	1,631,104	81	4.97
CY 1980									
Total	1,580,353	89	5.63	356,007	40	11.24	1,936,360	129	6.66
Embarked	276,915	35	12.64	19,885	5	25.14	296,800	40	13.48
Disembarked	1,303,438	54	4.14	336,122	35	10.41	1,639,560	89	5.43
CY 1981									
Total	1,611,049	67	4.16	355,415	33	9.28	1,966,464	100	5.09
Embarked	295,872	36	12.17	21,452	7	32.63	317,324	43	13.55
Disembarked	1,315,177	31	2.36	333,963	26	7.79	1,649,140	57	3.46
CY 1982									
Total	1,650,375	67	4.06	374,137	23	6.15	2,024,512	90	4.45
Embarked	300,888	29	9.64	21,489	2	9.31	322,377	31	9.62
Disembarked	1,349,487	38	2.82	352,648	21	5.95	1,702,135	59	3.47
CY 1983 (thru Feb)									
Total	259,350	11	4.24	59,750	2	3.35	319,100	13	4.07
Embarked	44,430	4	9.00	3,615	0	0.00	48,045	4	8.33
Disembarked	214,920	7	3.26	56,135	2	3.56	271,055	9	3.32

SEVERITY CLASS A GROUND MISHAPS

CY 1977 No./Rate	CY 1978 No./Rate	CY 1979 No./Rate	CY 1980 No./Rate	CY 1981 No./Rate	CY 1982 No./Rate	CY 1983 (thru Feb) No./Rate
17/.86	12/.62	9/.47	21/1.08	6/.31	2/.10	0.0.00

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Mishap Reporting Continues to Improve. Concise, well written and easy to understand mishap investigation reports (MIRs) are being submitted by aircraft mishap boards (AMBs). This helps all of us to detect and eliminate hazards and is the primary objective of the naval aviation safety program. This is also true of hazard reports. These reports are not privileged, making it possible to rapidly disseminate this information to all who would benefit from the contents. To continue to Make Aviation Safety Happen is to keep communicating.

The *WEEKLY SUMMARY* has recently introduced an interesting innovation to naval aviation safety. Through use of the Naval Safety Center data bank, Quarterly Class A F/FR Aircraft Mishap Projections for each type aircraft are being presented on a continuing basis. Hopefully, this will prompt operators of aircraft projected for one or more mishaps during an upcoming quarter to expend additional effort to beat the crystal ball. The box score beneath the projection graph lists current standings of the major commands under four broad mishap cause categories by citing the number of Class A/B/C F/FR mishaps and their rate of incidence per 100,000 flight hours. The page adjacent to the graph lists, by aircraft type, the specific contributing factors in all F/FR mishaps that have appeared more frequently in the past year. Let's beat the odds — we certainly don't want the computer to rack up the winnings.

There are three areas that continue to plague aviation safety. The first is the non-use or misuse of personal survival equipment. Aircrew personnel are still getting hurt or killed because of this. An article entitled "The 'Proper?' Use of Life Support Equipment" in our April 1983 issue of *APPROACH* addresses this subject well. We recommend you read it if you haven't already done so. The second area is FOD. We're still ruining too many engines and endangering crews and aircraft with FOD. The annual cost runs in the millions. The third area involves things falling from airborne aircraft. A number of the items falling do so because somebody failed to secure the part properly and nobody checked this during various aircraft inspections. In many others, however, factors such as faulty latches and hinges, fatigue and delays in change incorporations also contribute to the problem. This is particularly true in the helicopter community. Whatever the reason, falling parts jeopardize aircraft and their crew, as well as people and property on the ground if the aircraft is over land. We must make every effort to eliminate incidents of falling aircraft parts attributable to personnel factors.

Now, how are we doing so far in FY 1983? January was the third lowest Class A mishap month in the past 13 years. There were four mishaps, and the rate was 2.54. Only April 1978 (four mishaps/2.43 rate) and April 1982 (two mishaps/1.09 rate) fared better. Marine aviation continued its winning ways by going mishap-free in January. We slipped somewhat in February. There were nine Class A mishaps, and the monthly rate was 5.65. However, the cumulative rate for CY 1983 through February is 4.07, which is close to the CNO goal of 4.0.

Through March of 1982, the cumulative CY 1982 Class A F/FR aircraft mishap rate was 5.87. By the end of the year it had fallen to 4.45. You set a record last year, and you can do it again this year. Why? Because you're a new generation of informed safety professionals. A cautious sense of purpose is strapped to you as firmly as your kneeboards. You've learned that the base of your cerebral cortex and a heads-up display can tell you a lot more than the seat of your pants. Continue to Make Aviation Safety Happen by meeting or beating the 4.0 challenge. ◄

1982 CNO Safety Award Winners

CNO "Readiness Through Safety" Award

COMMANDER NAVAL AIR FORCE PACIFIC FLEET
COMMANDER NAVAL AIR RESERVE FORCE

Admiral James H. Flatley Awards

CV/CVN — USS NIMITZ
LPH/LHA — USS PELELIEU

COMNAVAIRPAC
VA-113
VF-1
VS-21
VP-31
HS-10
VRC-50
HC-3**
VA-145
VAQ-137
VAW-116
VS-41
HSL-33
VXE-6

CG FMFPAC
VMA(AW)-242
HMM-163
HMH-463
VMA(AW)-121*
HMT-301

CG FMFLANT
HMM-263
VMAQ-2
VMFA-451
HMH-461

COMNAVAIRLANT
VP-11
HS-15***
VC-10
HM-14
VAW-122
VRC-40
HSL-30

CG FOURTH MAW
HMA-773
VMA-124

CNATRA
VT-24
VT-26
HT-18
VT-23*
VT-10*

COMNAVAIRESFOR
VA-204
VP-68*
HS-85
VF-301
VR-57*
VAW-78

COMNAVAIRSYSCOM
NATC Patuxent River

*Second consecutive year
**Third consecutive year
***Fourth consecutive year

THE PILOT breathed a welcome sigh of relief. *Intrepid* 415 had just broken out below a hellblack overcast at 800 feet while on a precision final. Beneath a torrential downpour, the rain beat furiously upon the fighter, obscuring forward visibility as the water rippled across the windscreen. The pilot's mind was set on landing, but the weather had other plans.

Jarred by gusty winds, the cockpit instruments indicated a slight reduction in AOA as the airspeed started a rapid rise. The resultant increase in lift lessened the rate of descent and ballooned the aircraft to well above glide path. Adjusting pitch attitude, the pilot corrected back to the desired slope while the autothrottles overcompensated in reducing the thrust levers.

A fleeting thought passed. It dealt with some vague recollection of a rare meteorological phenomenon, but it was quickly discarded. Besides, it was only of concern to transport types. And even then, it didn't affect naval aircraft, especially those with high thrust-to-weight ratios, since they could easily power out of it. Meanwhile the craft began to shudder as the powerful winds shifted violently, unpredictably and dangerously. After all, it was only a typical, late afternoon summer storm.

Developing a rapid descent, going well below glide slope, 400 feet, how could things change so fast? Autothrottles disengaged, a little power ought to do it, besides, no approach is so bad that it can't be salvaged . . . AOA looks good, but that airspeed . . . No, it can't be right . . . Still sinking, drifting left, more power, have to break that descent, glide slope? . . . lineup . . . more power, 100 feet — BURNER!

Time seemed to stop. Then that cold, sweaty, nauseous sensation; almost numbing — like a nightmare compressed into a single instant — set in. It was followed by the realization we all hate and fear, knowing that we've lost control of a critical situation. There was no mistake. It was the anguish of failure in that awesome contest of life and death, with the ultimate stakes precariously tottering.

"Oh my God, I've lost it! EJECT!"

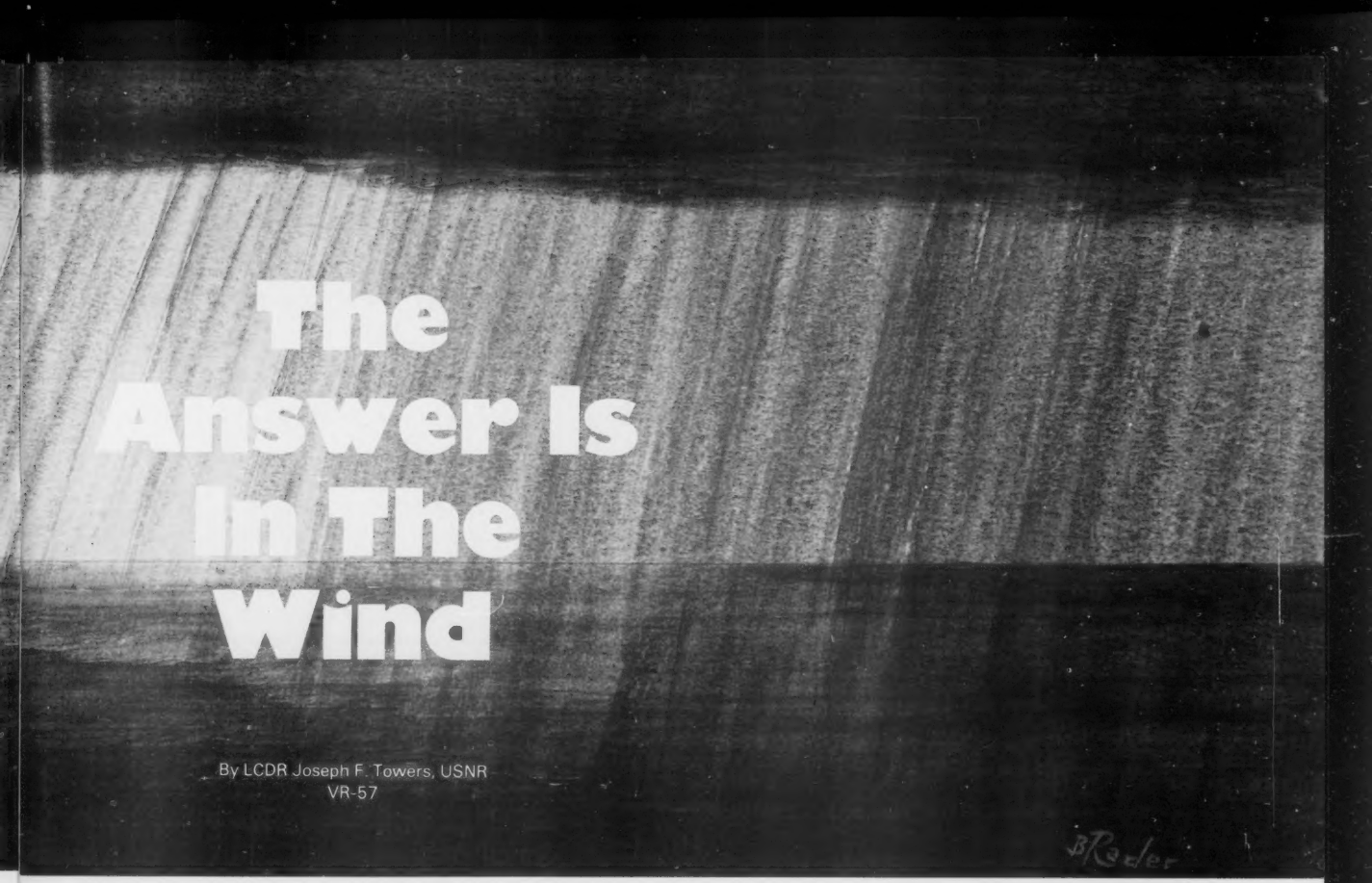
A bright orange fireball, followed by thick, billowing black smoke and total disintegration was observed one-half mile short of the threshold. No parachute emerged. There was no chance of survival, not in that burning, mangled wreckage.

Fortunately, this crash never really occurred. Or did it, possibly buried as some undetermined, obscure remnant in the past? Even worse, could it be the foreshadowing of a future event?

The summer season is upon us. The stage is set for a multitude of convective clouds, late afternoon thunderstorms and the associated, deadly phenomenon known as a microburst. The stakes are high and we're the players.

In case you're thinking that this phenomenon is a rare occurrence and can't happen to you, don't bet on it. Its existence in nature is far greater than anyone ever suspected.

A *microburst* is an intense, highly localized downburst



The Answer Is In The Wind

By LCDR Joseph F. Towers, USNR
VR-57

with velocities up to 60 knots or more that hits the earth and spreads out horizontally in a radial burst of violent, powerful wind. It may originate beneath any type of convective clouds with a life cycle of only two to five minutes. The phenomenon is just as likely to develop in a little- or no-rain situation as it is in a very heavy rain situation. The microburst has a diameter of 1,000 to 4,000 meters with maximum differential velocities existing slightly above the earth's surface at approximately 100 feet. The greatest probability of development occurs during the spring to summer months in the mid to late afternoon. (A downburst is essentially the same but has a diameter of 4,000 to 10,000 meters.)

According to Dr. John McCarthy, senior research scientist with the Joint Airport Weather Studies (JAWS) Project, a microburst of *mean intensity* produces a horizontal differential velocity of approximately 55 knots, while the *strongest can produce differentials in excess of 100 knots.*

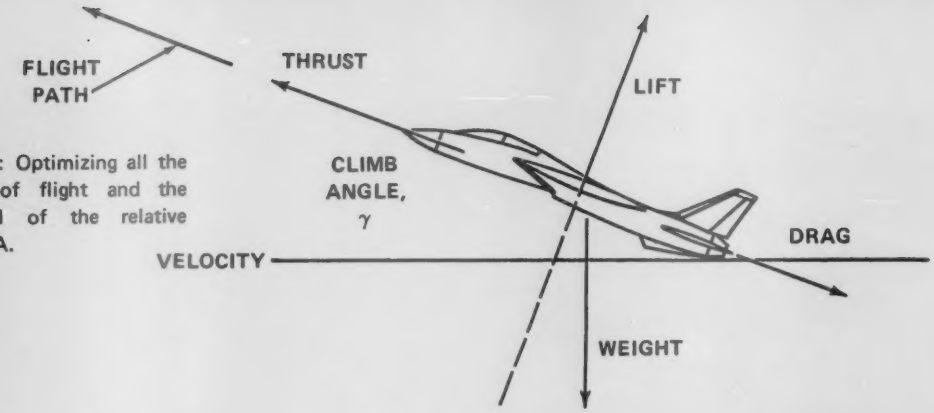
Most microbursts are so severe that being hit by one at the right point in space and time during the takeoff and approach phase will almost certainly result in disaster, regardless of aircraft type.

Look for telltale signs such as convective clouds, heavy rain, virga, turbulent and gusty conditions, blowing dust or roll clouds, tornadoes, wind shear alerts or pireps. As aviators, we must analyze the situation, and should any doubt exist, take whatever action is required not to proceed in harm's way.

Transport Category Aircraft. Over the years, two distinct schools of thought have evolved on how to optimize aircraft performance during microburst conditions. One technique is the "stick shaker method," which is essentially supported by the FAA, several aircraft manufacturers and many U.S. commercial air carriers. The second technique involves flying out at the minimum drag point and is primarily endorsed by ALPA (Air Line Pilots Association). The determining factor in choosing which method to employ appears to be primarily a function of where the aircraft is in relation to that enigmatic point of *extremis* and whether *long* or *short-term climb performance* is required.

Admittedly, I'm from the stick-shaker school in that I believe that if, through poor flight planning or an incredible stroke of bad luck, you ever find yourself falling out of the heavens because an *extremis* microburst condition has stolen much of your lift, you should actively consider flying out at (or preferably slightly above) stick shaker. This is especially valid when airspeed loss has placed the aircraft "further up the back side of the drag curve." This method seems to be the only viable option for transport category aircraft, since they often can't arrive at the desired minimum drag speed without further jeopardizing safety of flight.

Regardless of which method is more correct, there continues to exist an obvious failure in the successful execution of the required performance to avoid ground impact (e.g. aircraft are still crashing). This failure occurs when the philosophical discussion ends and the harsh



THE SOLUTION: Optimizing all the physical forces of flight and the precision control of the relative wind through AOA.

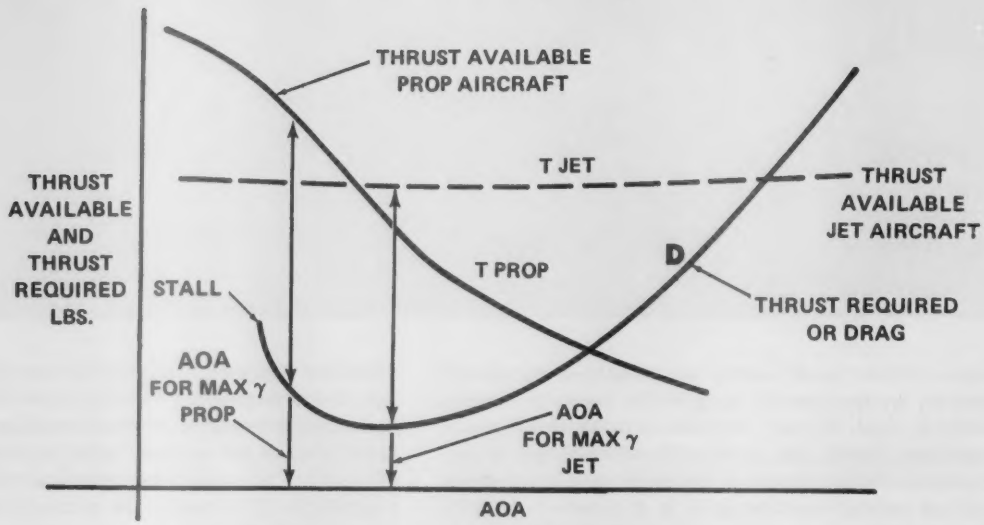
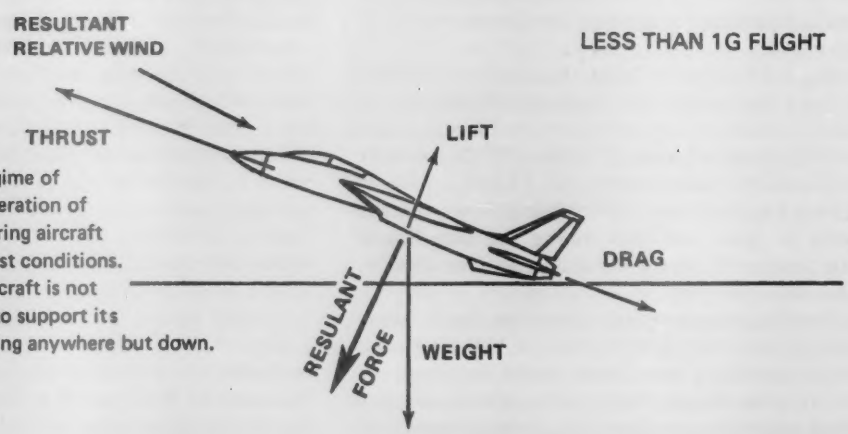


Figure (1)

Author's Note: IAS (velocity) has been intentionally deleted, since this relationship is believed to be essentially invalid during microburst flight.

Figure (2)



The transitory flight regime of near-zero or inverse generation of lift that can develop during aircraft flight through microburst conditions. Simply stated, if the aircraft is not developing enough lift to support its weight, then it's not going anywhere but down.

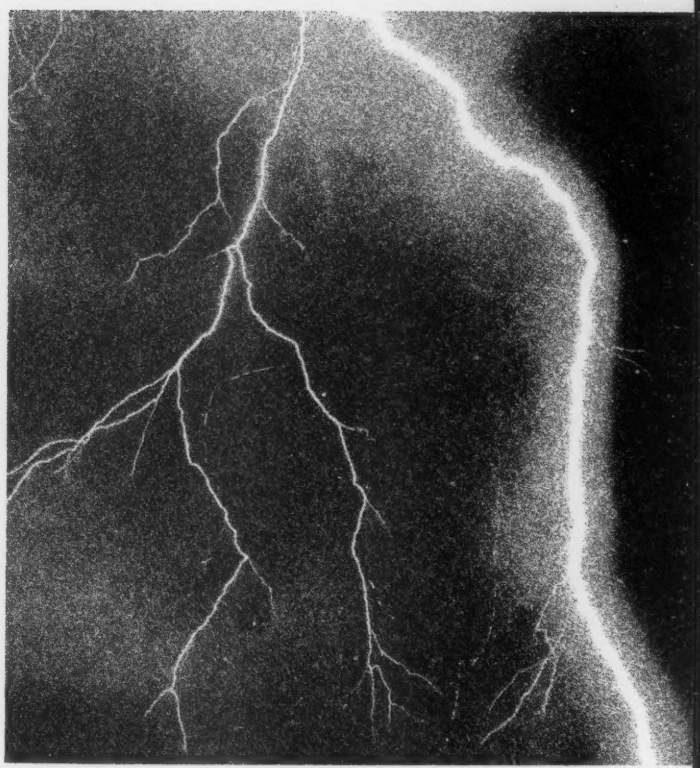
APPROACH diagram by Frank L. Smith

realities of life and death become precariously balanced in the cockpit. Perhaps this failure is the result of pilots misinterpreting the physical forces acting on their aircraft during microburst flight and their inability to counter them through improper technique or lack of aerodynamic capability, regardless of technique.

During microburst conditions, a potentially deadly situation exists in which an aircraft may be robbed of essential indicated airspeed to the point where it's now below the approach, departure or minimum drag speed. **As pilots, we've been obsessed more with loss of airspeed than flight path control. That's a dangerous preoccupation.** Furthermore, we've had little or no awareness of the effects that a dramatic change in angle of attack can have. In light of this, I believe that the loss of at least several aircraft has been exacerbated by the very fact that an attempt was made to arrive at this perceived minimum drag speed. This holy grail, possibly thought to be at or near the "magic bug setting" of V(ref) or V_2, was sought at any cost, either consciously or unconsciously, through *pitch attitude reduction*. I contend that during *extremis microburst conditions*, lowering your nose to maintain or regain lost airspeed may result in a further, more critical reduction in AOA, a significant loss of altitude, a degradation in climb performance and ground impact. I feel the favorable alternative would be to *establish an attitude which results in (or preferably slightly above) stickshaker speed, apply maximum thrust, and attempt to arrest the descent rate to AVOID ground impact.* This method appears at least to seek out a more favorable reference to the resultant relative airstream. I am skeptical of saving airspeed to flare and soften impact, especially over terrain which offers only a limited alternative to disintegration.

Incidentally, indicated airspeed is an inferior and invalid means of adequately determining the minimum drag point (maximum angle of climb) and actual stall. This conclusion is especially true in microburst conditions, since this regime is not representative of steady state wind with a corresponding "normal" relationship between IAS and AOA. Unfortunately, this is all many aircraft have available. What we should be more concerned with is the **minimum drag AOA** and **stall AOA**.

Wind shear effects may be partially explained in terms of loss of lift. It is agreed that loss of an aircraft's performance during microbursts is due primarily to the requirement to either 1) climb in a downburst or 2) accelerate inertially to maintain flying qualities. When an aircraft is in steady flight, climbing or descending, lift is very nearly equal to weight. And for long-term performance, the best angle of climb should occur at the AOA (Fig. 1) where there exists the greatest margin between thrust available and thrust required. There is no question in conventional aerodynamic theory that a turbojet aircraft attains its maximum *long-term climb angle* at this minimum drag point. It is the excess thrust (or power) which produces a climb by inertially accelerating the aircraft in the vertical plane through Newtonian dynamics.



In this classical method of analysis, it is critical that lift be very nearly equal to weight. Using the transitory flight regime of near-zero or inverse generation of lift which can develop during microburst flight ("Blueprint for Disaster," *APPROACH* Jan '83), I maintain that wind shear effects can be explained as a function of lift generation and classical Newtonian dynamics. Simply stated, **if the aircraft is not developing sufficient lift to support its weight, then it's not going anywhere but down!** The resultant vector (of lift, weight, thrust and drag) will create an unbalanced force to accelerate the aircraft in the downward vertical plane in accordance with Newton's Second Law of Motion, as shown in Fig. 2.

Navy Tactical Aircraft and the Most Ideal Solution. In case you're ever inadvertently confronted with an *extremis* microburst encounter, immediate and decisive action is required to survive. At present, I believe that aircraft performance can best be maximized by applying **MAXIMUM THRUST** (and executing a missed approach) while:

- initially rotating to the *AOA FOR MAXIMUM LIFT GENERATION* to discontinue or prevent a downward

inertial velocity and, once level flight or a positive rate of climb is achieved, then

- flying out at the *AOA FOR BEST ANGLE OF CLIMB* until a positive rate of climb is established and obstacles are cleared; finally
- accelerating to the *AOA FOR BEST CLIMB RATE.*
- If time permits, set an intermediate flap/slat configuration to achieve the most advantageous C_{Lmax} without a substantial increase in drag.

These AOAs should closely correspond with the minimum drag line (AOA not IAS) where thrust available exceeds thrust required by the largest margin, thereby producing the greatest possible inertial acceleration in the upward vertical plane. This technique should provide for positive lift generation slightly in excess of and then nearly equal to weight. *Optimizing all the physical forces of flight and precision control of angle of attack are important keys to success during this critical phase of flight.* This assumes, of course, that the given aerodynamic capability of the aircraft can exceed the physical forces of the shear or microburst. This is a dynamic condition requiring continuous adjustments in attitude until steady flight conditions are regained.

Under severe microburst conditions, IAS is an inferior and invalid parameter for adequately deciphering the entire aerodynamic picture. Consequently, the indiscriminate chasing of IAS in an escape maneuver, without cross-reference to other instrumentation, can, in itself, kill!

Passing Extremis. During microburst flight there exists a critical limit beyond which the point of *extremis* is clearly passed. Beyond this limit, recovery cannot be effected. When the pitch attitude has been reduced (even a few degrees) or the AOA has been reduced to near zero or some negative value, the aircraft experiences *less than 1-G flight.* Analysis of past mishap flight recorder data reveals that approximately .75 G or less typically exists for several seconds during this transition past *extremis.* It is during this period that any rate of climb then deteriorates into a *rate of descent.* This is an indication that the AOA has been severely reduced and that lift generation is now significantly less than weight. These conditions produce an unbalanced force with a resultant downward vector component which accelerates the aircraft with an increasing, downward vertical velocity in accordance with Newton's Second Law of Motion. This inevitably results in ground impact. During this latter phase, IAS may even register an *increase* due to acceleration.

So far as you and I are concerned, it is imperative that we *maintain a minimum of 1-G flight* and *AVOID the development of any descent rate.* If a positive climb rate cannot be initially maintained or achieved, attempt to fly out in at least a level flight condition. Once this downward acceleration has developed, it requires an *extraordinary force* to overcome, one which is nearly impossible for an energy deficient aircraft to generate. This is especially true when given very limited time and altitude constraints.

We've come a long way in increasing pilot awareness and understanding of this deadly meteorological occurrence. Its effects on aircraft performance are now becoming more clearly understood. So far in naval aviation, we believe that we have a unique, zero mishap rate with regard to this peril. With increased knowledge of the aerodynamic considerations involved, there's no reason why we can't keep it that way.

I believe that a solution to the wind shear threat may be found in the precision control of the relative wind through angle of attack and the optimizing of all the physical forces of flight. All of this, by the way, is simply a fine tuning of the phrase *power plus attitude equals performance.* The problem with wind shear conditions is that because the relative wind is changing so dramatically, it may easily exceed our ability to negotiate it! The answer may be in the wind, but the successful execution of the required performance to survive can be as elusive as the wind itself.

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What is the best microburst recovery technique?

TOTAL AVOIDANCE.

It all begins on the ground, with your forecaster and your DD-175-1.

WIND SHEAR ...the

THIS photo sequence, shot during experiments conducted by FWG Associates Inc. of Tullahoma, Tennessee, shows how a microburst can critically affect the flight path of, in this case, a *Boeing* 727.

Aviation Week and Space Technology recently featured a photo sequence reflecting these same FWG studies. In the accompanying article, writer Keith F. Mordoff describes how the research firm "was able to use the scale model with a radio controlled horizontal stabilizer to evaluate an operational procedure that could aid in flying through wind shear encounters."

When the elevator was programmed to lower the model's nose to gain airspeed as part of a recovery attempt, the model crashed repeatedly.

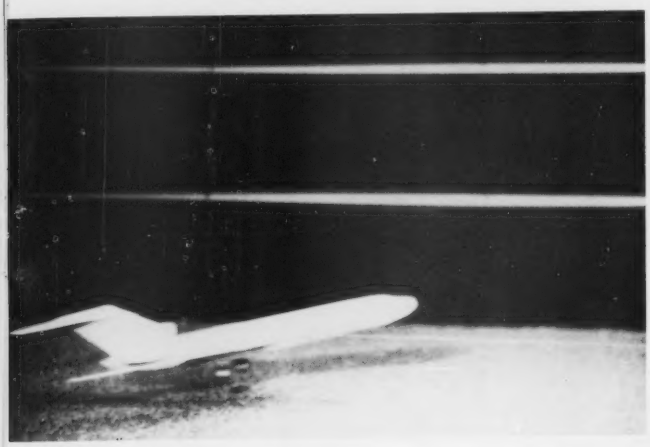
"When the alternate procedure of using up elevator to increase the angle of attack toward stall speed was used," Mordoff continues, "the model flew very close to the ground but usually was able to fly out of wind shear . . ."

For a more detailed analysis of both techniques, read the preceding story by LCDR Joe Towers of VR-57.

These photos were taken in a world of balsa, fans and CO_2 clouds. Let's hope — through cautious flight planning — that this is as close as any of us get to a real wind shear encounter. Total avoidance is certainly the best recovery technique!

(Our thanks to Dr. Walter Frost, president of FWG Associates, Mrs. Barbara Smith of FWG Associates and *Aviation Week and Space Technology* for their cooperation regarding this photo sequence. — Ed.)

experiments continue



1977 - 1981 World Class

This mercator projection may surprise you, because there's a widely-he
the fleet that most naval aviation mishaps occur during deployments at se
rate may be higher in certain bluewater situations, these little orange dot
where most of our aircraft are crashing...in our own back yard! It's someth
when you're flight planning for your next "milk run" in CONUS...

s A Mishap Locator Map

held misconception in
sea. *While the mishap*
dots vividly illustrate
ething to think about

Locations compiled by Dr. John Gaynor, Dr. M. B. Borowsky and LT Rick Wall
APPROACH diagram by Frank L. Smith

SIMULATED REALITY

By LT Tom Algeo
HSL-32

AS the HH-46A's engine wound down, my mind raced frantically for the correct emergency procedures.

"Single-engine failure on takeoff, let's see . . ."

On the one hand, I had plenty of airspeed for forward flight. On the other hand, I had more than enough runway for a landing. On the other hand, there was more sky than runway. On the other hand, the weather was hot and we were heavy. On the other hand . . .

In most situations, if you delay a decision long enough, the ultimate choice becomes either obvious or unavoidable. Our trusty *Sea Knight*, exhibiting its innate survival instinct, had determined that it was, in fact, landing, and if I wanted to help it out, fine.

As a Category I replacement pilot with my first simulated engine failure in what seemed to be the biggest piece of flying equipment ever created, I was somewhat awed by the rapidity with which events were beginning to take on a life of their own. My awe would have quickly turned to concern as I watched the remaining runway slipping quickly past the aircraft, but for the calm and unruffled demeanor of the instructor pilot.

"Well," I said to myself, "obviously I have this situation under better control than I realize." I now began slowly to recall and perform the required procedures. Having completed these steps, there was still the remaining concern (not yet a problem) of remaining runway versus remaining groundspeed versus remaining ideas.

"Select *Hover Aft*," I ordered confidently.

The IP responded promptly and correctly. As the fore and aft rotor heads programmed to the Hover Aft ("Speed Brake") position, I felt the aircraft slow . . . a little . . . maybe.

Sometimes you reach a point where you have to face the fact that something is terribly wrong. I had reached that point. A simulated emergency that had seemed relatively routine 4,000 feet of runway earlier had now developed into an *extremis* situation, requiring immediate action to avoid a serious mishap. Since my attempt at aerodynamic braking had failed, I elected to apply the wheel brakes — hard. Except for some token deceleration from 40-plus knots, the brakes proved to be too little, too late. As the last few feet of precious runway (but there was so *much* of it only a moment ago) slipped gracefully beneath the aircraft, this young aviator realized he was out of ideas.

Now the instructor pilot (remember him?) took the controls, pulled collective and managed to scream "ECL! ECL! ECL!" The cockpit was filled with the smell of something burning, so I assumed we had an engine fire and placed my hand on the good ECL. I did, however, remember from ground school that one should never secure an engine unless the other pilot agrees. The other pilot did not agree. "NO! NO! NO!" he said, without the use or need of ICS. The turns were beginning to bleed off and I finally realized that, fire or no, we needed power. I slammed the bad ECL to FLY.

In the meantime, the IP had his hands full. The overrun was fairly rough, so he decided to sacrifice some turns in order to get airborne, banking on getting them back when his copilot (me) quickly assessed the situation and returned the bad ECL to FLY (risky assumption, since it was my situation assessment that had gotten us here in the first place). Having received a less-than-instantaneous response from my side of the aircraft, he was not only forced to land, he also had to land short of a ditch off the end of the runway (we obviously weren't going to get over it). When an H-46 pilot wants to stop fast, he flies sideways. The IP executed a side-flare to a safe (if somewhat rough and dusty) landing. As the wheels touched down, the failed engine came back up to speed. After a short air taxi back to the duty and a quick cleanout of weeds from the wheels and brakes (brakes? cockpit fumes?), we headed home. Enough excitement for one day.

The flight was over, but a question remained: Why did a perfectly good aircraft run off the end of a runway that was several times longer than what was normally required for a single-engine landing?

I can't speak for the instructor pilot, who did an outstanding job of making the most of a bad situation; I can only speak for myself. The reason for this incident was my pilot error. Fine, but why? First, pilots in a training syllabus can easily get into a "simulated" frame of mind. Everything is a canned test of your abilities, and it's often difficult to judge exactly where simulation ends and reality begins. The ECL was pulled out of FLY as a simulated emergency. I never considered putting it back in FLY when the situation became real life. I simply accepted the failed engine as an unalterable fact, and worked around it.

Second, I refused to admit anything was wrong. As a result, I got as much help from the left seat as I asked for — none. There's a reason for the "multi" in multipiloted. A simple request for help could have prevented the entire incident. Whether in training or in real life, the other pilot is there to help.

And last, but definitely not least, is **procedures**. Had I executed the correct procedures promptly, we would have come to a halt with more runway ahead of us than behind us. Prevention being the surest cure, letter-perfect knowledge of procedures would certainly have cured our ills.

This incident taught me at least three things: (1) **If you're not in a simulator, it isn't simulated.** (2) Pride goeth before a fall. Ask questions, get help and use everything that you've got. (3) PROCEDURES. Don't leave home field without 'em. ◄

By William M. Teppig, Jr.

HEAT SHADOW

the hidden killer

IT was the morning of the second day of carrier type training off the coast of north Florida in late summer, 1974. The first day's operations had featured a "Sinkex" in which the air wing's attack assets had tried to sink a derelict vessel at sea. Unfortunately, everyone missed the target and the mission was rescheduled for the next day's first launch.

The ordnance load was extra heavy. In fact, I'd never seen as many bombs carried by an air wing. The training schedule also called for the ship to launch an Alpha strike during the first launch. (An Alpha strike is ordered to allow a ship to demonstrate its capability to launch an all-out attack against a target.) This meant there were *two* unusually large groups of aircraft scheduled for the first launch, with both groups carrying large quantities of ordnance.

The weather over the area was below minimums for this type of training, so the first launch was held on deck and plans were made to double-cycle it with the second launch, which was already being brought up on the flight deck. The ordnance for the second launch was waiting when they got topside. The second launch was a second-wave Alpha strike against the target range, and the ordnance had to be prepositioned on deck in the "bomb farm" if the flight deck crew was to make the upload and launch on time.

Nobody wants to be responsible for busting a launch during type training . . .

The weather over the target range was "give and go" or clearing, but not quite up to the minimums required. The second launch (a double) was delayed on deck while waiting for the weather to lift. Now, the ordnance for the third launch started arriving on the flight deck! Those folks below decks had a schedule to meet too, and by golly they weren't going to look bad during type training. A slight pause to review how the flight deck looked at that time. Bombs, bombs and more bombs, and more aircraft than you could imagine. The entire bow area was so jammed with bomb-laden aircraft that both catapults were blocked — totally covered with aircraft is a more accurate description. The rest of the flight deck was just as crowded, with only the outboard waist catapult semi-clear for launching. The flight deck was undergoing a very sluggish respot for launch. There just wasn't any maneuvering room left, and the "spot" would lock in place at the slightest SNAFU.

It was close to the scheduled launch time for the third launch, so it was time to bring in the helo for a crew switch and hot pump. The only spot large enough to accommodate the helo was between the waist catapults, just aft of midships. The helo landed, and I took my crew out to man it while the rotors were still turning (a hot-crew switch). The flight deck crew was connecting the fuel hose to the helo's side. I let my copilot strap in first while I walked around the helo to judge just how much clearance was available for takeoff. It was tight, but not too tight. Everything was well within limits and according to the book, but still tight.

The F-4s behind me were already starting up and were itching to go drop bombs on something. Two EA-6Bs were being spotted directly in front of me, leaving about 20 feet of rotor-disc-to-wingtip clearance. No sweat for a fleet pilot. What I really didn't like was the fact that the day's density altitude was about 2,000 feet and that I'd have to do a left slideout off the flight deck (requiring more power) and that I was spotted directly inboard of the "doghouse." The doghouse is a platform just aft of the mirror and slightly below flight deck level on the port side of the carrier. It extends approximately 25 to 30 feet outboard of the flight deck. This

We were falling out of the sky. Why?

NAVY
B.Rader

meant that I'd have to have enough power available to hover out of ground effect after just passing over the deck edge during a left slideout, with a full bag of gas, and maintain my clearance over the doghouse.

I briefed my crew that we were going to check the power required to hold a hover and if it checked out within squadron SOP (85 percent torque), we'd do a left descending buttonhook departure. This would involve a loss of altitude, hopefully well beyond the doghouse, and a tight left turn for 180 degrees. No problem. Remembering that the ship was usually reluctant to cut any slack for helos, I told the deck crew to stop the fueling about 500 pounds before our maximum fuel load was reached.

We ran through the hot-seat checklist, which is an abbreviated takeoff checklist because most of the items are already running. I called the air boss for takeoff clearance and was cleared to lift off and do a slide left with an initial heading 180 relative to the ship's heading. The winds were given as "350 to 23." I couldn't believe it; the winds were perfect, right down the angle.

No sweat.

I pulled the helo up into a hover and checked the power required to hover: 85 percent. Not 86 percent or 84 percent, but 85 percent. Just like the thing had read the squadron SOP and NATOPS the night before. I was certainly glad that I'd cut the fuel load "500 pounds for mom and the kids." Well, with perfect winds and a hot crew, we could try anything once. Besides, everything, and I mean *everything,* was within limits and according to the book.

I started sliding left; the crew had already checked in and was ready to go get 'em. Keeping a close eye on the doghouse, the gauges and those two EA-6Bs 20 feet in front of my rotors, I started my left slideout. Then, just as my left mainmount crossed over the edge of the flight deck, I saw some black puffs of smoke coming from the exhausts of both the EA-6Bs. Those guys were trying to do a "Blue Angel" start! I thought to myself, "I sure hope we don't get a lot of burble from those $8*7&#s!" No sooner than the last expletive left my mind, I heard, felt, sensed and saw BOTH OF MY ENGINES start unwinding as if they'd just been turned off.

The torque gauge was passing down through 65 percent, the rotor RPM was unwrapping from 90 percent and it was starting to get very quiet inside the aircraft. I looked out my right window and saw my line division chief pick up a lineman 25 pounds heavier than he, throw the kid 10 feet up the flight deck and then start running after him. I looked to the left at my copilot and shrugged my shoulders. We both knew that I had already made all the control inputs possible. Maximum collective and full right stick. I looked back to the front and saw the outside air temperature pegged out at the maximum.

We were falling out of the sky. Why? The winds were perfect. We weren't too heavy. I hadn't cleared the flight deck, so we still had some ground cushion. We couldn't be out of gas; we'd just gassed up. Bad fuel? A double engine failure? I didn't know.

All I could think of was to try and roll the helo off the flight deck. If we started coming apart in the catwalks, we knew it could sink the ship with all that hanging ordnance out on the flight deck, not to mention the bloated bomb farm. With one mainmount on the flight deck and one in the catwalks, I lowered the collective and put in left stick to roll us off the flight deck. I also realized that we had a better chance of staying alive in the water than fragging everything on the flight deck by coming apart in the catwalks. The rotor tip speed on an H-3 *Sea King* is just about 450 miles an hour, and if it starts slinging off blades, they come straight out from the aircraft. That's about 150 pounds of just-subsonic aluminum loose on the flight deck for each blade. And when one comes off, the others follow.

Just as I put the corrections into the controls, my No. 1 engine started to come back on the line. I banged the collective down to the bottom, pulled it back up to my armpit and kicked in full right rudder to unload the tail rotor and gain back a little power. The helo yawed about 45 or 50 degrees to the right as it jumped out of the catwalks and flopped back on the flight deck. I had about five feet of clearance between my rotor blades and the *helmets* of those EA-6B drivers in front of me. Not to mention a startling voice change. The air boss called and asked if I would like them to move those A-6s. I replied in the affirmative. The rest of the flight proved to be uneventful.

The unusually large amount of ordnance near our flight operations posed a danger, but not one that wasn't a daily occurrence on Yankee Station off Vietnam. Very few F-4s blow up sideways. So long as you stay away from their noses and tails, you'll be pretty safe. Helos aren't like that! When they have "problems," they throw great big chunks of metal over the horizon. It resembles a strafing attack at flight-deck level with very large bullets. It was obvious that the superb airmanship routinely demonstrated by my squadron had lulled everyone into a false sense of security.

The "spot" was so crowded and locked up that there was NO ROOM WHATSOEVER for a damage control party. The aircraft were already manned, and most of the aircraft near me had already been started and taxied into a holding position for their chance to launch.

It could have been the worst catastrophe in naval history.

How did we come so close?

Like most accidents and near accidents, it took a chain of events to set the stage. The massive amount of ordnance on the flight deck only increased the danger to the ship, as did the jammed spot that completely negated any kind of damage control efforts. The can-do spirit of all of the dedicated men onboard the ship certainly played an important role in

setting the stage for this near-tragedy. What was the precipitating cause for the mishap? Why did the engines decay? What was this hidden killer?

HEAT SHADOW

What is "heat shadow"? I'll tell you what it isn't. It isn't briefed as a danger. It isn't recognized as a danger. There's no training conducted to combat its effects. There's not even a rumor about the stuff!

Well, what is the stuff? It's a danger unique to the carrier navy. It's particularly dangerous to helicopters. The NATOPS manuals for fixed-wing aircraft all have a section warning the pilot not to taxi too close to the aircraft in front of him because exhaust gases could overheat aircraft engines or cause them to windmill up in an accelerating RPM mode. Both of these are factors you don't want. Still, they're no sweat when you're **on** the flight deck at the time. **They are a problem when you're hanging on a column of air over the top of it.**

Only carrier naval forces generate this hazard and only carrier naval forces expose their aircraft to its dangers. The routine method to spot a deck for a launch is to park the aircraft with their exhausts vectored outboard. This greatly reduces the dangers to the flight deck personnel and it's the only logical way of doing it. Therefore, when a carrier is conducting flight operations and the deck is spotted with aircraft that have their engines "turning and burning" at low power settings (required for personnel safety), there are huge *heat shadows* drifting aft from each of the exhausts. Normally, these *heat shadows* pose no problems. In fact, once you get used to breathing burnt JP-5, they can be quite pleasant during winter time in the North Atlantic. Here's the danger. When these shadows are present, they'll trail down alongside the ship, and if it's heading into the wind and if a helicopter is required to pass closely aft of the heat source, i.e., the exhaust, the engines on that helicopter start sucking a lot of very hot air. In fact, if you extrapolate the performance charts in the back of the H-3 NATOPS (none of the charts go above 60°C) you'll quickly realize that an H-3 probably can't generate enough horsepower to turn the accessories when the turbine inlet temperatures are in the 150°C to 200°C range. (See Fig. 11-7 Section XI and Fig. 3-5B Section III Part 3 in the Appendix.)

Expediency, short-term goal orientation, overconfidence and poor judgment are all buzz words for the safety profession and naval aviation alike. I think *heat shadow* is going to have to take its place among them. The future mandates increased use of increasingly costly helicopters and V-STOL aircraft that will use jet engines for power generation. We had a near miss. Let's not let *heat shadow* remain invisible until we have a real tragedy.

Recommendations. After field tests aboard ship, develop mandatory clearance minimums for helicopters (or V-STOL) passing downwind of aircraft with their engines running. These clearances may depend upon relative wind, wind velocity, aircraft power settings and type of aircraft, but general safe limits should be relatively easy to develop. I would anticipate a rapid diffusion of the exhaust gases and sharp temperature drops.

Prohibit sliding departures from the carrier deck over obstacles. There are just too many ways to get killed doing this maneuver. The flight capabilities of helicopters make them easy to spot on the flight deck, but give them a break and spot them safely. Ensure that all flight deck personnel, aircraft handlers and spotters and yes, even the air boss are well aware of this phenomenon and its dangers.

Train helicopter pilots to watch for the danger and place the appropriate warnings in the various NATOPS manuals.

IT'S ALMOST IMPOSSIBLE TO GET ALL OF THE "RIGHT" FACTORS TOGETHER AT ONE TIME TO STAGE THIS HAZARD, BUT IT HAS ALREADY HAPPENED ONCE! ◄

Since 1974, the safety of helicopter operations from CVs has improved through revision to the CV NATOPS. Revisions have included new launch and recovery envelopes based upon dynamic interface testing and the incorporation of a warning not to launch helicopters through fixed wing jet exhaust. The latest CV NATOPS Conference approved the following additional precaution:

"Helicopters shall not be landed or launched where their engine performance or stability could be affected by turning jet engines."

The flexibility and versatility of the helicopter is well appreciated. However, not all helicopters are created equal in terms of performance capability. The H-46 can accept winds for launch well outside the launch envelope of an H-3. In the incident described, it is most probable that power required to hover (out of ground effect) exceeded the power available. The result was rotor droop. However, this is difficult to verify without actual readings of Ng, gross weight, etc. Ingestion of exhaust gases into an operating jet engine will, at the least, degrade performance. Significant exhaust gas ingestion, as would occur when passing directly through the exhaust plume of a turning A-6 or F-14, could result in momentary flameout due to compressor/combustion chamber match problems. Simply stated, jet engines were not designed to operate on carbon monoxide.

Helicopter performance is affected by numerous factors. Manuals provide charts for calculating the effects of some of the variables, such as ambient conditions and gross weight. Other, more extreme factors simply preclude operations. Pilots must be aware of all the conditions that effect performance. — Ed.

Wrong Time for ZZZs . . .

"CREW from Flight, we're descending below 1,000 feet, LPAs are required." That word was passed over our P-3's intercom during a night ASW training flight. We finished the descent checklist and got down to the business of trying to localize our "target of opportunity." By this time it was 0300 and we were at 300 feet. Sound familiar? Night flights can be harrowing or a pleasure, depending on your outlook.

I was scheduled for a 2300 preflight, 0200 takeoff and 0800 return on a Monday night to Tuesday morning hop. To me, the timing was perfect. That meant I was going to have all day Monday off and all day Tuesday off — all for a six-hour flight. Seemed like a nice way to get an extra long weekend and to get a few things done on Monday that could only be done during the day.

I started Monday by running all around town during the morning and grabbing a light lunch at a local fast food joint (mistake No. 1). During the afternoon, I helped put out a garage fire because I'm a member of a volunteer fire department and a concerned citizen (mistake No. 2). At 1700, I played a light game of racquetball just to get a little exercise and to help wear me out so I could sleep a few hours before it was time to go to work (mistake No. 3). Around 1830, I stretched out to get those few hours of shuteye before I had to tackle the "all night burner." The only problem was, I couldn't get to sleep. I wound up lying on the couch for about four hours with frequent trips to the kitchen for a few "munchies" (mistake No. 4).

When I got to work, I grabbed a cup of coffee and a pack of *Twinkies* for the quick burst of energy I needed. It would help me make it through the preflight and the first couple of hours in the sky, until I could be relieved by the second engineer (mistake No. 5).

The preflight and first two hours aloft went uneventfully. I was lulled into a false sense of calm while I sat in the seat at 300 feet above the pitch black ocean. By this time, I was really starting to feel exhausted and caught myself trying to doze off a couple of times. In spite of this, having about a half hour or so left to go in the seat, I decided to take a few deep breaths, rub my eyes and stick it out for just a little while longer (mistake No. 6).

The next thing I knew, I opened my eyes to find myself being closely watched by my PPC, copilot and second engineer. How long had my eyes been closed — two, three, four minutes? As near as I could tell by my watch, I'd fallen asleep for at least 10 to 15 minutes.

Oh yes, by the way, not only was it nighttime, at 300 feet, but we were also operating in a three-engine loiter configuration. Can you see the possible implications involved here? Some food for thought: How long does it take for a turbine to fail? How long does it take for a massive oil leak to result in a seized engine? How well can a person react to an engine fire when he first opens his eyes from a rather deep sleep?

Luckily, nothing like that happened. The result was nothing more than a written and verbal reprimand, along with a whole lot of shame and embarrassment. But it could have been a lot worse. It could have ended with the deaths of 13 people and the loss of a multimillion dollar airplane.

The flight engineer's position is one of great responsibility. Many times we are a primary safety factor at low altitude. With one pilot operating the radios and solving ASW problems, and the other pilot totally concerned with flying the airplane, that only leaves the F/E to monitor and constantly evaluate the systems and workings of the airplane.

It doesn't take very long for a minor

ANYMOUSE

malfunction to turn into a catastrophe when the people involved are not totally alert.

The P-3 is equipped with sleeping accomodations in the back, and that's where sleeping should be done. The flight station is not the place to doze or nap. There's no crime in being tired during a flight, but to not admit it and get some relief is dangerous.

In a nutshell, I've learned a few lessons from this experience. Crew rest means crew rest, not taking care of all the details you've been putting off for your first day off. It really is important to eat properly before a flight. Coffee and *Twinkies* will fill the void and give the quick pick-me-up you may need, but the effects are short-lived. When they wear off, it's quick and hard. The flight station is no place for a heroic, "I can do it" attitude. If you're tired, admit it and get out. You're doing yourself and 12 other guys a big favor.

Flaps Up

LAUNCHING from NAS West Coast on the last leg of a weeklong cross country, our Navy multiseat tactical jet crew was manning and taxiing for the second time.

Attempt No. 1 had been aborted due to low oil lights.

Because of the delay, we'd had our first good night's sleep in four days the night before and were feeling refreshed and eager to get home.

The unexpected delay had put us behind schedule, however. We weren't going to make the arrival time I'd promised the duty officer and duty maintenance team at Hon.eplate.

Taxi to a hold short was rushed as we tried to update the clearance and weather and perform the takeoff checks. After arming his seat, the GIB (guy-in-back) turned down the ICS to better hear the weather update.

At the hold short, I watched the final checker as he inspected our wings and belly. Switching to tower, I chafed a little when I was told to expect a three-minute delay. Finally, with clearance for takeoff, the GIB was back up on ICS, all aircrew acknowledged ready, and I went to full power to start my takeoff roll.

After 2,000 feet of roll, the linespeed check was a little high, but acceleration appeared normal.

At rotation speed, I rotated the stick aft, but the nose felt heavy and wouldn't break the deck. I checked engine instruments normal, airspeed passing 150 knots, and thought the trim must have run nose down and that I'd have to muscle the nose up. Releasing backstick and then pulling hard aft, I saw 160 knots as the nose broke the deck.

With the stick back in my lap and the plane just not feeling right, I sensed the right wing starting to drop. I countered with left stick, but the aircraft continued to roll right. Realizing the aircraft was not going to fly, I lowered the nose and put the aircraft back on the runway with 5,000 of its 12,000 feet remaining. High-speed abort procedures were followed in accordance with NATOPS, and with the long-field gear rapidly approaching and the airspeed indicating 130 knots, I lowered the hook and brought the aircraft to a stop in the arresting gear.

A scan of the cockpit showed the **flap handle up** and the **flaps indicating up**. I remembered the NFO calling for items before and after the flaps on the takeoff checklist, but not the flaps.

I can now say from personal experience: Don't rush your checklist, don't take anything for granted (like a final checker or a copilot), don't get sloppy with your checklists and do yourself a favor — take one last look before you go.

The only things that saved this crew and aircraft were a 12,000-foot runway, the right decision at the right time and the grace of the Almighty.

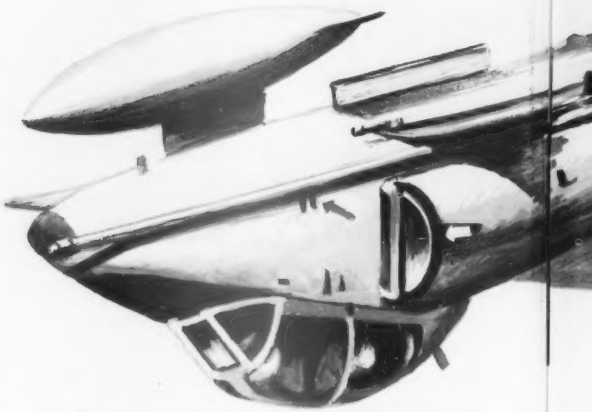
NeverAgainMouse

"Fuelish" Hazard

I was watching a V-4 fuel handler dragging a fuel hose across the flight deck. The hose was so worn that wire inside the hose was dragging on the deck, leaving a 1-foot trail of sparks. I approached him and told him the hose should be fixed. He seemed unconcerned, so I further stressed the hazards involved with this practice and attitude. Unwillingly he called a fuels maintenance repairman. All the repairman did was clip the piece of wire with a pair of dykes instead of replacing the section of fuel hose. I think the fuels division should pay more attention to the condition of its equipment. Fuel is one of the major hazards onboard ship and cannot be approached with a nonchalant attitude.

Fuelishmouse

Direct Hit, On Fire, Eject!



By Richard A. Eldridge
APPROACH Writer

"FIVE, four, cameras, three, two, one, mark!" Sound like a take on a Hollywood movie set? It could have been, but the sequence of photos on this issue's back cover shows dramatically that truth is more dangerous than fiction. What started as a routine mission — photo chase for a stores separation test — turned into a disaster less than two seconds after the above transmission.

The principals in this sequence were an F-18 with a photographer in the rear plus a TA-4J, also with a photographer in the rear. The mission was twofold: first to expand the stores jettison envelope of the F-18, and secondly to demonstrate that the stores management system (SMS) software was correctly programmed to default to a gravity release mode (auxiliary release) upon failure of the normal jettison mode. The F-18 was equipped with a vertical ejector rack (VER) with an inert Mk-82 bomb attached.

Test plans called for the VER with bomb attached to be released from the F-18's starboard wing. Due to supervisory error, however, the *wrong type of bomb was loaded on the starboard wing*. No one detected this error during preflight.

Upon UHF check-in, the *Hornet* pilot was informed by Range Control that station No. 8 on the starboard wing had been improperly configured; as a result, that VER/bomb combination would not be released. Station No. 2 on the port wing was loaded correctly, however, so it was decided that the release would be made from the port wing station.

Primary photo coverage was the responsibility of the photographer in the F-18. The TA-4's function was to act as chase aircraft. **In a postmishap interview, the chase pilot stated he was unaware that his photo data was to be used only as a backup in case the F-18 cameras failed.** Furthermore, it was not made clear to the TA-4 pilot that the release would be by the auxiliary mode (which was a gravity release rather than a ballistic release).

The release method is critical to the VER/store trajectory. No emergency procedures or chase aircraft responsibilities relating to a store/VER collision with the F-18 were ever briefed, although this was the primary mission of the chase aircraft. In the words of the F-18 pilot, who was the flight leader, "The *Skyhawk's* main job was to provide photo coverage of the VER bomb rack and attached Mk-82 bomb being jettisoned." (It appears as if some confusion existed as to who was responsible for what.)

On the first run of the test, no drop was made nor was one intended. The purpose of the run was to demonstrate that the SMS would revert to the auxiliary release mode. During the second run, a release was intended but didn't occur. The reason was the failure of the F-18 pilot to turn the MASTER ARM switch on during the first run.

The third test run was a repeat of the first run with no release intended. With the MASTER ARM switch ON, the SMS fault logic reverted to the auxiliary release mode. On the fourth (mishap) run the VER/bomb assembly was released. The photos on the rear cover depict what occurred more explicitly than words can.

The store struck the TA-4's starboard wing approximately three feet from the wingtip. It tore a large gash in the wing, rupturing the fuel cell. The collision sheared off the entire

aileron and a large portion of the starboard wing. Following the collision, the TA-4 made two rapid rolls to starboard, entered a series of out-of-control gyrations and burst into flames.

Approximately 15 seconds after the collision, the TA-4 pilot initiated command ejection. The *Skyhawk* ejections were successful, and the two crewmembers were rescued from the water by boat.

The chase aircraft's position at release point was critical to this mishap. There had been only one previous release with the VER/store combination from the F-18 using the auxiliary release mode. That release had been from the inboard wing station No. 3, *not* No. 2 as in this mishap. Since there was no mention of the chase aircraft position during the preflight brief, the TA-4 pilot was guided by a command instruction stating that the chase aircraft should be in "a loose position at 4 to 5 o'clock from the test airplane at a distance of **200 to 500 feet.**" (Since the release was from the port wing, the clock position would equate to 7 to 8 o'clock vice 4 to 5 o'clock.)

As the *Skyhawk* pilot put it: "I felt that everything was fine and that I was in good shape. I was completely aware of the possibility that this thing could hit me, and my first concern was to maintain sufficient lateral separation . . . At release I estimate I had eight feet stepdown, five feet nose-to-tail clearance and 10 to 20 feet wingtip-to-wingtip separation. I felt that the rack/bomb would most likely fly straight aft and that if it did move to the side, it would be well past both airplanes before it flew out as far as the wingtip . . ."

Obviously the rack bomb didn't understand its stage directions. In this mishap, the lead pilot, chase pilot and ground engineers fell into the trap of inattention to detail. This arose from a sketchy briefing, an eager but misguided sense of chase plane safety details, the late add-on of an unanalyzed test, the misunderstanding of the release mode by the chase pilot, and switchology problems by the lead pilot. No prediction information had ever been developed for this release. It appears that previous successes on ejected releases and unjustified assumptions by the flight crews involved may have led to this easygoing attitude. ◄

BRAVO ZULU

AD3 Edward L. Copeland

WHILE working as a power plants troubleshooter for VS-37 embarked on USS ENTERPRISE, AD3 Edward L. Copeland demonstrated courage and concern for fellow shipmates by promptly acting to save the life of another. On 3 January 1983, AD3 Copeland had just completed launch preparations on an S-3A aircraft for a morning launch when he observed a flight deck blue shirt cross the launch foul line while an A-7 was at full power, ready for launch. Without hesitation and while keeping low, AD3 Copeland ran to the man and grabbed him 10 feet inside the foul line as the catapult officer signaled to fire the catapult. The catapult officer and deck edge operator suspended the catapult as AD3 Copeland quickly returned the man to safety outside the launch area. AD3 Copeland placed his own life in danger to save another. Had the catapult fired, AD3 Copeland's action to force the man to the deck would have prevented certain severe injury and probable death. ◄

1983 APPROACH reader survey

In order to make *APPROACH* the most interesting and useful aviation safety magazine possible, we ask that you fill out this survey, fold and mail it as soon as possible. Please be completely candid in your answers and comments. All survey forms must be returned by 31 July 1983.

- Your Rank/Rate/Grade:

  a. O-10/O-7
  b. O-6/O-5
  c. O-4/O-1
  d. W-4/W-1
  e. E-9/E-7
  f. E-6/E-5
  g. E-4/E-1
  h. GS-
  i. WG-
  j. Nongov't (specify)

- What is your designation or job?

  a. Pilot/NFO
  b. Aircrewman
  c. Aviation maintenance
  d. Flight surgeon/physiologist
  e. Air controller
  f. Survival/Life support equipment
  g. Other (specify)

- Has an *APPROACH* story ever saved you from harm or helped you prevent an aircraft mishap? ☐ Yes ☐ No Please elaborate:

  _____

  _____

  _____

- Please name or describe the best *APPROACH* story to appear during the last year:

  _____

  _____

  _____

- Do you think the magazine's appearance has improved recently? ☐ Yes ☐ No If so, how?

  _____

  _____

  _____

- Rank the following types of stories in order of your preference (1-like best; 5-like least):

  a. ____ Personal narratives ("There I was at 30,000 feet with my wings icing up...")
  b. ____ Aeromedical and flight physiology stories
  c. ____ Technical/hardware developments in aviation safety
  d. ____ Philosophy/management ideas in regard to aviation safety
  e. ____ Mishap and incident writeups

- Does *APPROACH* shy away from any important aviation safety issues? If so, what are they?

  _____

  _____

  _____

- If you could change one thing about *APPROACH*, what would it be?

  _____

  _____

  _____

Other Comments.

FOLD

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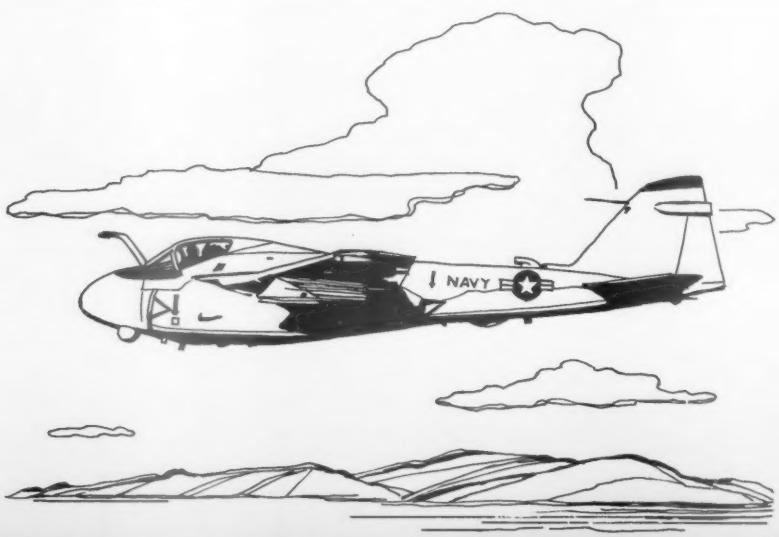

Skyhawks in Flames

By LtCol Gary McLeod

Tower: "A-4 on the roll, you're smoking or streaming fuel!"
Wingman: "Lead, looks like you're leaking gas."
Lead: "Got no indication in here. Wait one . . . Fire light! Dash 2, do you see anything?
Wingman: "Hey, lead — looks like smoke now!"

As the tail erupts in flames, the wingman calls, "Lead, you're really flaming now — Get out . . . Eject! Eject!"

Before

After

SCRATCH one of the few remaining *Skyhawks*. But why? The scenario is all too common. The aircraft was fueled by the "alternate" method (which really is the most common one). Wing and fuselage fuel caps were loosened to keep the fuel cells from overpressurizing in the event of a failed automatic cutoff. After refueling, the lineman forgot to cap the fuselage tank and the pilot failed to check the cap's security (it *is* a little awkwardly placed, you know). As airspeed increased during climbout, the airstream suctioned fuel out of the fuselage cell, allowing it to flow aft in the upper avionics compartment and through the engine cooling ducts to the engine bay. Sound like that might be the requisite fuel-air ignition mixture for combustion? You bet it is!

Since 1968, 22 instances of A-4 flights with missing fuselage fuel caps have been reported. Of them, five were TA-4Js. Only one of those resulted in a fire, and it was a minor one. Worst case — less than Category C damage. When the fuel flows out of a TA-4's fuselage gravity fueling post, it's generally dissipated in the airstream.

Not so with the tactical A-4s equipped with upper avionics compartments. The "hump back" encloses the fuselage fuel cap area and channels the airflow down to the engine cooling air ducts. **Of the remaining 17 instances of flight without the fuselage cap, 11 resulted in fires.** Seven of those resulted in major mishaps, and one was a Class B. Three aircraft were destroyed, and two pilots lost their lives.

Now that's the bad news. The good news is that there's a very simple fix. Every aviator flying one of the humpbacked A-4s must check the fuselage fuel cap to ensure that it's on tight. There have been several airframes changes over the years to make the preflight check easier. There have also been several proposals to eliminate the hazard entirely, but they've been rejected: install a spring-loaded flapper in the opening like the one in your new car's gas tank throat (won't vent fuel if the pressure fueling cutoff fails); put in a pressure relief valve (same problem during ground fueling); lock the cap on forever (same problem). It seems to be almost impossible to find a way to release pressure when necessary (ground pressure fueling) and to prevent venting when you don't want it (airborne without the cap in place).

The A-4 weapons system manager is currently investigating other design changes to solve the problem. However, the A-4 is an old bird, and complicated/expensive fixes just aren't likely to be forthcoming.

From 1968 through 1974, reported flights *sans* fuselage cap averaged two per year. From 1975 through 1982, the average was one per year. It's a safe bet that there will be one in 1983 unless we learn from our earlier mistakes. The solution is so easy . . . **check the cotton picking cap on every preflight!** ◄

When the Pressure is On

By Capt Dave Bick
VMA-211

SEVERAL days ago one of our more experienced pilots, who had recently joined the squadron from another unit, prepared to depart on a cross-country training flight. During preflight, he discovered a discrepancy that had been a **downing gripe** in his previous squadron. After discussing the problem with maintenance control personnel, the pilot was informed that the discrepancy was *not* a downing gripe in his new squadron. He was then forced into a tough situation. Should he accept Maintenance Control's decision and fly an aircraft while feeling ill at ease with it, or should he decline the bird? The obvious answer is that he should have declined to accept it. The decision sounds simple, right? Well, maybe not.

The pressure put on a pilot to **get the X out** comes from a myriad of different sources: higher headquarters, operations, maintenance and, perhaps most importantly, his peers. This pressure, when examined in conjunction with a professional attitude and operational safety, generally proves beneficial. This type of pressure arises naturally within any group of achievement-oriented individuals.

But let's look at the other side of the coin — when a pilot is assigned an aircraft he's unsure about and the pressure to accept it outweighs his professional attitude and the goals of operational safety. Let's also look at some of the ways pressure at the squadron level is forced onto individual pilots.

Operations. As we all know, Operations is, and should be, the implementing force of the daily routine in the squadron. It encompasses those who write the flight schedule and those responsible to the commanding officer to ensure every pilot is combat-ready. When sorties don't make it out of the chocks, pilots have to be rescheduled, target times have to be adjusted and priorities have to be reevaluated. It can, during certain critical operations, really throw a monkey wrench into the works. The pressure is intensified.

Maintenance. Most maintenance departments operate on a fairly rigid and preplanned schedule. Maintenance Control determines which airplanes are going to fly and which are going to be in for work (often several days in advance). When an aircraft goes down in the chocks, that maintenance schedule is disrupted. Having to work with one less airplane, Maintenance Control's options and flexibility are reduced. Personnel working on other scheduled jobs must now be pulled off to correct preflight gripes, etc. It's also frustrating for the troops to see several hours of work readying that aircraft for flight now wasted. If a pilot downs an aircraft for a discrepancy that (according to Maintenance Control) is not a downing gripe, you'd better believe they're going to tell the pilot about it. The pressure is on from Maintenance Control!

Peers. During periods of decreased flight time, when pilots are scheduled to fly, they want to get the most out of every hop.

If an aircraft doesn't make it out of the chocks, there may be a substantial period before the pilot is rescheduled for that X again. If you're a section or division leader and you don't accept your assigned aircraft because you don't feel comfortable with it, your wingman probably won't get to fly either. As a result, your wingman may not be very happy, and you, as the flight leader, are going to feel the pressure.

Say, for example, your compass system goes down, but it's VFR to the moon. Your flight is going to a target where you've been a hundred times before. You've got someone on your wing in case anything else goes wrong. Besides, your wingman hasn't flown for two weeks and he really wants that X. The pressure is on from your peers!

OPNAVINST 3710.7 states, "The pilot in command is responsible for the safe and orderly flight of his aircraft and the well-being of the crew." Additionally, it states, "In the absence of direct orders from higher authority cognizant of the mission, responsibility for starting or continuing a mission with respect to weather and/or any other condition affecting the safety of the aircraft rests with the pilot in command."

In other words, when you sign for that aircraft, it's *your* responsibility. You, as the pilot in command, have the final say as to the airworthiness of that airplane. Period!

The old hands in the squadron have a responsibility to the new pilots. This is where COs, AMOs, operations officers and division/section leaders come in. They must be taught, by example, what is acceptable and what is not and, equally important, why it is or is not.

An attitude must be developed in your squadron which makes it *easy* for a pilot not to accept an aircraft for flight which he is unsure about, regardless of the pressure. This attitude needs to be fostered by the "heavies" in the squadron at every opportunity.

The next time the pressure is on to accept and fly an airplane you're uncomfortable with, ask yourself the following question: If I decide to fly this aircraft, and things turn to worms, will I be able to justify my decision to the Skipper, or worse, a mishap board? **If your answer is no, you've made your decision.** Remember — it is *your* decision!

What would YOU do to help a shipmate?

- pay the rent?
- pay the medical bills?
- fix the family car?
- educate his or her dependents?

Of course you would...if you could. Sometimes, though, the needs of our friends go beyond our ability to help. Our friends suffer and we suffer with them.

This is where the NAVY RELIEF SOCIETY can help. The NAVY RELIEF SOCIETY was established nearly 80 years ago to help members of the Navy and Marine Corps and their families whenever and wherever hard times strike. Over 90,000 men and women receive assistance each year from NAVY RELIEF.

Your keyperson will contact you. Please give. It's the least you can do for a shipmate.

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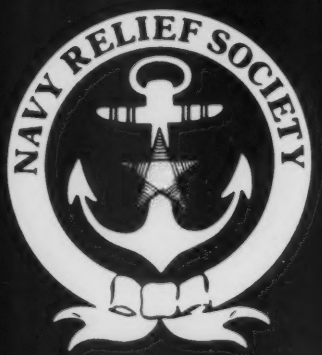

A basic tenet of a successful safety program is the concern of every individual in the well-being of his or her shipmates. It works in safety, it works in our program to eliminate drug abuse, and it works in the personal lives of everyone in the Navy and Marine Corps. The question "What would you do to help a shipmate?" has a slightly different twist than those normally seen on the pages of APPROACH, but we at the Naval Safety Center recognize the relationship between stress caused by personal problems and safety on the job. — Ed.

Lights, cameras, action!

How could something like this happen?

See the story beginning on page 26.